

COOPERATIVE RESEARCH REPORT

No. 35

**FOURTH REPORT
of the
ICES/ICNAF JOINT WORKING PARTY ON NORTH ATLANTIC SALMON**

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A. INTRODUCTION

1. Previous published reports of the Working Party¹⁾ have presented results of its activities up to 1970. They have presented data on the growth of the salmon fisheries at West Greenland and in the Norwegian Sea from 1965-69, and the results of investigations on the composition, origin and biological features of the salmon stocks involved, together with assessments of the effects of these fisheries on total and home-waterssalmon stocks and catches. This Report presents further information and results of its work at meetings in 1971 and 1972, one in March 1971 at Pitlochry, Scotland and the other in March 1972 at Dublin, Ireland. The representation at these meetings was as follows:

	<u>March 1971</u>	<u>March 1972</u>
Canada	A W May	A W May C P Ruggles
Denmark	O Christensen Sv Aa Horsted	O Christensen Sv Aa Horsted J Møller Jensen
England and Wales	I R H Allan A Swain	I R H Allan A Swain
Faroe	A Reinert	-
France	R Vibert	R Vibert P Devaine ^{x)}
Federal Republic of Germany	F Thurow	F Thurow
Iceland	-	T Gudjonsson
Ireland	Miss E Twomey A E J Went	Miss E Twomey A E J Went
Northern Ireland	-	K U Vickers ^{x)}
Norway	L Rosseland	L Rosseland
Scotland	W R Munro B B Parrish (Chairman) K A Pyefinch (Rapporteur)	W R Munro B B Parrish (Chairman) K A Pyefinch (Rapporteur)
U.S.A.	J B Kimsey G J Ridgway	R Hennemuth ^{x)}

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- 1) Report of the ICES/ICNAF Joint Working Party on North Atlantic Salmon, 1966. Int.Council Explor. Sea, Coop.Res. Rep., Ser.A, No. 8, 27 pp (1967).
Second Report of the ICES/ICNAF Joint Working Party on North Atlantic Salmon, May 1968. Ibid., Ser. A, No.12, 18 pp (1969).
Third Report of the ICES/ICNAF Joint Working Party on North Atlantic Salmon, December 1970. Ibid., Ser.A, No.24, 36 pp (1971).

	<u>March 1971</u>	<u>March 1972</u>
ICNAF	L R Day	L R Day
ICES	-	J Møller Christensen

x) Present for part of the meeting only.

2. Informal meetings, between those members of the Working Party available, were also held during the Statutory Meetings of the International Council for the Exploration of the Sea in 1970, 1971 and 1972.
3. In the Third Report, it was recommended that a large-scale salmon tagging experiment should be conducted, for a period of about three months, during the time of the West Greenland fishing in 1972 and that a small group of experts, with Dr A W May as Convener, should meet to make arrangements for this experiment. This group met twice; immediately before the meeting of the Working Party at Pitlochry in March 1971 and in Copenhagen in January 1972. Representatives of Canada, Denmark, England and Wales, France, Norway, Scotland and U.S.A. attended both meetings.

B. WEST GREENLAND FISHERY

4. At its Annual Meeting in 1970, ICNAF adopted a resolution setting out a number of regulatory measures for the salmon fishery in its Convention area during 1971. This resolution is set out in Appendix 1. These measures, which came into force on 1 January 1971, included a limitation of the aggregate tonnage of the fishing vessels employed or the catch taken by each Contracting Government to the 1969 level and the prohibition of the use of any monofilament nets not acquired before 1 July, 1970. The events in the West Greenland fishery in 1971, dealt with below, are considered in the light of these measures.

1. Statistics and Composition of the Fishery

5. The salmon catches at West Greenland in the years 1960-71 are shown in Table 1. In 1971, as in the previous year, it was not possible to separate the catch by Greenland vessels into its drift-net and gill-net components.
6. The total catch in 1971 was 2 689 metric tons, which is a substantial increase over the catch for 1970 (2 146 metric tons) and is the highest catch yet recorded at West Greenland. Though this catch cannot be completely separated into drift-net and gill-net components, the former was, almost certainly, the larger. On the basis of the catches made by research vessels,

the size and age composition of the salmon stock exploited were very similar to those in previous years. The stock consisted almost entirely of one-sea-winter fish which had migrated to sea as two- or three-years-old smolts. The remainder consisted of fish older than one-sea-winter. The sex ratio (3.1 females:1 male) was also similar to that in previous years.

7. As in previous years, the total catch shown in Table 1 includes a small catch (less than 10 metric tons) taken at Angmagssalik on the east coast of Greenland. The distribution of the fishery in 1970 and in 1971 is shown in Figure 1. In 1970 the extent of the fishery was similar to that in 1969, but in 1971 the drift-net fishery extended all along the west coast, from the Disko area in the north to the vicinity of Julianehåb in the south and gill-netting was carried out at a number of places along this length of the coast.

8. The table below shows the number of vessels (excluding Greenland-registered vessels) which have taken part in the West Greenland drift-net fishery from its inception in 1965.

Year	Number of Vessels				
	Denmark	Faroe	Norway	Sweden	Total
1965	0	1	1	0	2
1966	0	1	1	0	2
1967	4	4	3	0	11
1968	10	2	4	1	17
1969	15	6	11	2	34
1970	13	7	10	1	31
1971	11	3	8	0	22

9. The number of non-Greenlandic vessels participating in the drift-net fishery in 1971 was fewer than in 1970, yet the total catch taken by them was approximately 350 metric tons greater. This must mean either that the abundance and/or availability of salmon in the offshore area was substantially greater in 1971, giving rise to higher average catch rates per vessel and/or that the total effective fishing effort was higher despite the fewer vessels, due to an increase in their fishing power and efficiency. Although insufficient data are available for the changes in fishing power and efficiency to be determined accurately it is known that in recent years improved, more efficient drift-net gear has been adopted progressively by the fishing fleet. Changes in the gear which may have contributed to the greater efficiency are:-

- (a) The use of monofilament nets, which comparative fishing experiments have shown to give higher catch rates than the polyfilament nets used previously. Monofilament nets were first used by a few vessels in 1969 and their use increased rapidly thereafter and, in 1971, most of the drift nets used were monofilament.
- (b) The introduction, by some vessels, of a floating, unbuoyed drift-net head line instead of the normal buoyed line. Limited comparative fishing experiments showed that nets rigged in this new way gave higher catch rates.
- (c) A progressive adoption of the most efficient drift-net mesh size.
- (d) An increase in the number of nets shot per day by some vessels, through the use of monofilament nets during daylight.

10. Although the combined effects of these factors cannot be estimated accurately, the available data suggest that between 1968 and 1971 they, together with a general increase in crew 'skill and experience', resulted in at least a doubling of the average fishing capacity of the individual fishing operation and that, therefore, in 1971 the total effective fishing effort by the drift-net fleet was not lower than in 1970. Thus it seems likely that the increase in drift-net catch in 1971 was not primarily due to greater stock abundance, as the average catch per vessel would suggest.

11. These data indicate clearly the limitations of the vessel tonnage regulation introduced in 1971 as a method of stabilising effective fishing effort in a fishery in which major technological and other developments affecting fishing power and efficiency were taking place. Nevertheless the measures introduced did prevent the entry of additional tonnage into the fishery.¹⁾

1) Further regulatory measures, involving catch limitation in the West Greenland fishery were agreed at the ICNAF Meeting in 1972.

2. Origin and Destination of Salmon at West Greenland

2.1 Recaptures of Fish at West Greenland Tagged in Home Waters

12. Recaptures during 1963-71 of salmon tagged in home waters either as natural (wild) or hatchery-reared smolts and as kelts are shown in Tables 2, 3 and 4. These tables include new data and revisions of data presented in earlier reports of the Working Party.

13. The latest data show that in 1971, as in previous years, fish tagged in the main salmon-producing countries were recaptured at West Greenland and particular attention is drawn to the recoveries of salmon tagged as wild smolts in the extreme south-west of France in 1969 and 1970. Additional tags were reported from Norway, bringing the total recapture from the West Greenland area for that country to eleven. Salmon occurring at West Greenland are, therefore, now known to originate on the European side from about latitude 63°N to about 44°N, which is almost the southern limit of the species. Attention is also drawn to the high number and recapture rate, in 1971, of hatchery-reared smolts tagged in the USA in 1970. Seven of these tagged fish, together with one from Canada, were taken in the small east coast catch mentioned in para.7, which indicates that salmon from North American rivers had migrated far up to the east coast of Greenland.

14. Some fish tagged as kelts in home waters have been recaptured at West Greenland, usually in the autumn following release and, in particular, there was a substantial increase in the number of Canadian tagged kelts recaptured in 1970 and 1971.

15. The Working Party again agreed that it was not possible to obtain reliable estimates of the proportions of the salmon stock at West Greenland originating from individual countries from the tag recapture data. However, the latter continue to indicate that the major part of the West Greenland salmon stock is derived from rivers in Canada, Great Britain and Ireland.

2.2 Recaptures of Fish Tagged at West Greenland and in the Labrador Sea

16. In 1970 and 1971, British, Canadian and Danish scientists conducted further tagging experiments at West Greenland. Eight local recaptures were made from 1 to about 30 days after release. Of the fish tagged in 1970, four recaptures were made in home waters (Canada 2, Ireland 1 and Scotland 1). During the 1971 experiment a hatchery-reared fish tagged in the USA in May 1970 was recaptured in Diskofjord and released after re-tagging.

17. Tagging was also conducted in 1970 and 1971 by Canadian scientists in the Labrador Sea, a total of 86 fish being tagged. Eleven recaptures have been reported, 6 in the northeast of Newfoundland and 5 in or near Chaleur Bay on the borders of the Canadian provinces of Quebec and New Brunswick.

18. Table 5 gives details of all of the recaptures of fish tagged at West Greenland and in the Labrador Sea from 1965 to 1971 inclusive. This shows that 36 recaptures have been reported in home waters, 27 of which were of salmon tagged in the West Greenland area. Of the latter, 12 were recaptured in North America (Canada) and 15 in Europe (Great Britain, Ireland and Spain). Attention is drawn to the recapture in the River Ason in Spain, which is near the southern limit of the species on the eastern side of the Atlantic.

2.3 Other Studies

19. Investigations were continued in 1970 and 1971 on biochemical characters and parasite fauna (as biological tags) in relation to the study of the origin and mixing of salmon at West Greenland.

20. Canadian investigations of blood serum protein in association with parasite studies have provided promising results. Blood samples of 204 Atlantic salmon taken in the Labrador Sea and the West Greenland areas in the autumn of 1970 were analysed by Canadian scientists, using methods described in previous reports. Forty-nine percent of the fish were identified as North American in origin and 51% as European, a result similar to the proportionate returns of salmon tagged at West Greenland and recaptured in home waters (para. 18). Further work is in progress to check these results.

21. Research on transferrin polymorphism, which was carried out in England, had indicated that a certain proportion of the salmon can be distinguished as to the continent of origin. An analysis of 964 blood samples collected in the West Greenland area in 1970 showed that 18 (2%) could be specifically identified as fish from the UK, 159 (16%) as fish from North America though the remaining 807 (82%) could not be allocated between the two populations. Further research on these latter fish is in progress. With the cooperation of a Danish commercial fishing vessel, 1 830 blood samples were collected in the West Greenland area in 1971 and these are now being analysed. Work on various biochemical aspects of this problem is also currently being undertaken in other countries.

22. Work on parasites as biological tags was continued in 1970 and 1971. Canadian results indicate that the abundance of the parasite Anisakis

simplex in North American salmon at West Greenland and in home waters is consistently lower than for European salmon, whereas the parasite Eubothrium crassum is more prevalent in West Greenland and in North American than in European salmon.

23. Other methods for separation of stocks are being investigated. Of these, the use of scale characteristics, which has proved so successful in the case of Pacific salmon, appears to be promising. Work in this field is in progress in a number of countries but the results are not yet sufficiently advanced for the full value of this method to be assessed.

3. Assessments of the Effects of the West Greenland Salmon Fishery

24. Previous assessments by the Working Party of the effects of the West Greenland fishery on home-waters stocks and catches of two- or more sea-winter salmon have been based on estimates of the changes in total weight (i.e. the resultant of natural mortality and growth) which would have occurred in the salmon comprising the West Greenland catch had they not been caught there and, if surviving, had returned to home-waters in North America or Europe (ICES, Coop.Res.Rep., Ser.A, Nos. 8, 12 and 24). The losses to the combined North American and European home-waters stocks for a West Greenland catch of around 2 000 metric tons, as in 1969 and 1970, were estimated in this way to lie in the range 1 100 - 2 700 metric tons, and to the home-waters catches of between 650 and 1 600 metric tons (using upper and lower values of instantaneous natural mortality rate of 0.1 and 0.02 per month respectively). For a West Greenland catch of around 2 500 metric tons as in 1971, these estimates of losses would be increased pro rata to 700 - 2 000 metric tons.

25. In addition to the above direct assessments of home-water losses and with a view to obtaining further evidence on the natural losses of salmon occurring between their presence at West Greenland and their return to home-waters a simulation study was made of the combined Canadian and UK home-waters catches of two-sea-winter salmon, using ranges of values of the exploitation rate at West Greenland, of growth in weight between West Greenland and home-waters and of home-waters exploitation rate. The results of these calculations (for further details see ICNAF Res. Doc. 71/72), given in Table 6 suggest that the exploitation rate at West Greenland in recent years has been less than 30% but probably higher than 10%, and that the natural loss rate compatible with this range of values and the observed Canadian and UK two-sea-winter salmon catches in recent years lies within the range used in the earlier direct assessment. They gave an estimated loss to all home-waters fisheries, for a West Greenland catch of 2 000 metric tons of between

500 and 1 900 metric tons, which is in good agreement with the estimate of 650 - 1 600 metric tons obtained by the direct assessment. It must be stressed, however, that the estimates of losses obtained from the simulation calculations are based on the assumption that all of the two sea-winter salmon caught in the home-waters fisheries had previously been present in the area fished at West Greenland. Since this may not be the case, the losses derived from them may be overestimates.

26. Detailed studies of recaptures at West Greenland of salmon tagged as smolts in Canadian rivers show that individual rivers make markedly different contributions to the exploited stock at West Greenland. The contribution is relatively small from some rivers, but appears to be substantial from rivers running into the Gulf of St. Lawrence. Thus Canadian home-water losses differ markedly between river stocks, apparently being greatest for the Gulf of St. Lawrence rivers of which the Miramichi is the largest. The steady decline in abundance of two or more sea winter salmon entering the Miramichi River since 1960, and of grilse since 1965, began amongst year classes produced before the West Greenland fishery reached a high level. It is possible, however, that the West Greenland fishery has contributed to the decline in recent years.

C. NORWEGIAN SEA FISHERY

27. At its Annual Meeting in 1970, NEAFC adopted a resolution setting out a number of regulatory measures for the salmon fishery in its Convention area during 1971. This resolution is set out in Appendix 2. These measures, which came into force 1 January 1971, included a closed season (1 July to 5 May), closed areas ((i) east of longitude 22°E and (ii) between latitudes 63° and 68°N east of the Greenwich meridian), a minimum size for salmon caught (60 cm) and a minimum hook size (gape not less than 19 mm). These measures have affected the catches in 1971 to such an extent that, in several respects, they are no longer comparable with the catches of previous years.

1. Statistics and Composition of the Fishery

28. Data on the catches taken and the number of vessels operating in the Norwegian Sea fishery in the years 1965-71 are given in Table 7, and the areas fished in 1970 and 1971 are shown in Figure 2. Table 7 shows that the rapid growth of the long line fishery since 1965 was halted in 1971 as a consequence of the new regulations. In fact, the fishing effort was lower and the catch only amounted to about half that in 1970.

29. Information on the catch per unit effort in the long line fishery in 1966-71 is given in Table 8. Judged from information on the fishery in 1969 and 1970 the abundance and/or availability of salmon in the exploited area seems to rise gradually from February until April and decline during the remaining part of the season. The Danish catch per unit effort data for May-June was approximately the same in 1969, 1970 and 1971. It should, however, be noticed that observations in 1970 and 1971 show a marked decline of abundance and/or availability of salmon during June. As the fishery in 1971 was extended over a long period in June the catch per unit effort data for this month are not strictly comparable with those for previous years.
30. Owing to the establishment of closed areas in 1971, the long line fishery was restricted to north of latitude 68°N and west of longitude 22°E from the Norwegian fishery limit to a distance of 360 nautical miles from the coast (Figure 2). The main fishing was concentrated within 100 nautical miles from the coast. No commercial salmon fishing was conducted in the vicinity of the Faroe Islands in 1971.
31. In previous reports, it has been pointed out that about 90% of the exploited stock in the Norwegian long line fishery in the period February to mid-May had already spent two or more winters in the sea but that, after mid-May, one-sea-winter fish formed an increasing proportion of the catch. As the fishing season in 1971 was restricted to May-June it was to be expected that, in comparison with previous years, one-sea-winter fish would form a greater proportion of the total catch. This was supported by the Danish catch data which showed that about 15-20% of the catch (15% of the landings) consisted of this sea age group, compared with 10% in 1970. Prohibition of fishing in the closed areas, where the catches of former years were especially dominated by older salmon, probably also contributed to this increase. It would, however, probably have been greater but for the minimum fish and hook size regulations. The former resulted in some discarding of fish below 60 cm in length.
32. As in previous years, the condition factors of the two-sea-winter salmon caught in the long line fishery varied widely but were, on average, low compared with salmon of the same sea age caught at various localities in Norwegian coastal waters. However, the difference between the condition factors of the salmon in the two fisheries in 1971 (10-15%) was less than in previous years (20-30%).

2. Origin and Destination of Salmon in the Norwegian Sea

33. Information on recaptures in the Norwegian Sea fishery of salmon tagged as smolts in home waters is given in Tables 2 and 3 and of salmon tagged

as adults in the Norwegian Sea, in Table 9. Data for 1971 indicate that, as in previous years, the great majority of salmon fished in the Norwegian Sea originated from and returned to Norwegian rivers, though some recaptures were recorded from rivers in the USSR.

34. During the spring in 1969, 1970 and 1971, Faroese and Scottish scientists also undertook tagging experiments off the Faroes. A total of 666 salmon was tagged and 31 recaptures, shown in Table 10, have so far been reported; 15 in Scotland, 6 in Norway, 5 in Ireland, 2 in England, 1 in the USSR and 2 at West Greenland. Most of the recaptures were made in the year of tagging. Of those recovered in home waters for which data on the sea age are available, 19 were grilse and 7 were two-sea-winter salmon. The two West Greenland recaptures are of particular interest as they suggest that the Faroes may be on one of the routes taken by European salmon on their migration to the West Greenland area.

3. Assessment of the Effects of the Norwegian Sea Fishery

35. In 1970, data on the age composition of long line samples showed that, as in previous years, about 90% of the exploited stock in the Norwegian Sea consisted of fish which had spent two or more years in the sea and that therefore the effects of this fishery on home-waters stocks and catches would be confined mostly to two- or more sea-winter salmon. Comparable data for 1971 showed that with the implementation of the seasonal and area closures, the proportion of these salmon in the long line catch decreased somewhat, averaging approximately 80%.

36. The assessment of the effects of the Norwegian Sea fishery on total salmon yield (Norwegian Sea plus home waters) was approached, as in previous years, using data on the increase in weight of the fish from the period of peak fishing in the Norwegian Sea to the period of peak fishing in Norwegian coastal waters and on the proportion of fish present in the fished area which, if not caught there, would subsequently be caught in the home-waters fisheries. Although accurate measures of this proportion are not available it is possible to estimate a limiting value for it, above which the presence of the long line fishery would lead to a decrease in the total catch from the population of two-sea-winter salmon. For 1970, it was estimated to lie in the range 77-83% and for 1971, when the peak of the fishery in the open sea occurred later than in 1970 (due to the closure at the beginning of the season), it was approximately 90%. The available data suggest that the average exploitation rate of two-sea-winter salmon in the river systems to which these salmon, if surviving, would return, was below these levels (as shown in para. 37, estimates from a simulation model indicated that it lay between 50 and 80%)

and that therefore the Norwegian Sea fishery in both 1970 and 1971 resulted in a larger catch of two-sea-winter salmon than would have been taken in its absence. It should, however, be pointed out that the overall average 'quality' of the catch taken in the offshore fishery in both years was lower than that taken in home waters.

37. In the last published report of the Working Party (ICES Coop.Res.Rep., Ser.A, No.24, 1971), a provisional assessment was made of the losses to the two-sea-winter salmon stock in home waters resulting from the long line fishing in the Norwegian Sea. On the assumption that the loss due to natural mortality between the time the salmon are exploited in the open sea and their return to home waters is about the same as the increase due to growth, it was estimated that the losses to the home-waters salmon stocks to which two-sea-winter salmon in the Norwegian Sea return would be roughly the same as (but not greater than) the Norwegian Sea catch. It follows, therefore, that in 1969 and 1970, the estimated loss to the home-waters stocks was around 800 - 1 000 metric tons. The corresponding estimates of losses to the home-waters catches in these years were probably within the range 400 - 800 metric tons.

38. With a view to gauging the reliability of this assessment, a simulation of home-water catches of two-sea-winter salmon in Norway was made along the same lines as for the West Greenland fishery (see para. 25), using ranges of values for the exploitation rate in the long line fishery, the growth in weight between their occurrence in the long line fishery and their return to home waters and the exploitation rate in home waters. The results of these calculations, taking the long line catch as 1 000 metric tons, the Norwegian home-waters catch of two-sea-winter and older salmon as 800 tons and the proportion of the survivors in the exploited stock homing to Norway as lying between 80 and 90%, are given in Table 11. These results provide support for the assumption used in the earlier assessment that the natural mortality between the time the salmon are present in the offshore fishing area and their return to home waters is low and certainly not greater than the gain in weight of the survivors. They also indicate that the average exploitation rate in home waters is likely to lie in the range 50-80%. Estimates of the loss to home-waters catches using these values, ranged between 500 and 1 040 metric tons, which are similar to those obtained in the earlier assessment.

39. Since, as shown in Table 7, following the implementation of the closed season and area regulations in the Norwegian Sea, the long line catch in 1971 was substantially smaller than in 1969 and 1970, the estimated losses to the home-waters stocks and catches were correspondingly smaller. The catch

of two-sea-winter salmon by the long line fishery in 1971 was about 400 metric tons so the estimated loss to the home-water stocks of these fish was approximately of this magnitude and the loss to the home-water catch was within the range 200 - 300 metric tons. As in previous years, most of this loss would occur in the Norwegian home-waters fishery.

40. It must be emphasized that, as for the West Greenland fishery, these assessments of losses concern only the immediate direct effects of the long line fishery; they take no account of any possible long-term effects from possible decreases in smolt production and salmon recruitment, resulting from a fishery-induced reduction in spawning stock. At present, too little is known of the relation between spawning stock size, smolt production and recruitment of grilse and salmon to the Norwegian stock for these effects to be estimated.

D. HOME-WATERS CATCHES

41. Catch statistics for the home-water fisheries are given in Table 12 and catch per unit effort data are given (in greater detail than in previous reports) in Table 13. Information on changes in catches in individual countries is summarised below.

42. England and Wales. The overall picture presented by the salmon and grilse catches for 1971 is that of a reduction from the 1970 level; due mainly to reduced net catches, the rod catches having remained steady at the low level experienced over the past four seasons compared to the previous six seasons. The total catch for 1971 by all methods was, however, still above the average for the period 1960-70. The major component in the overall catches has again been the catch made by the commercial net fishery in the English northeast coastal area. Apart from this, the rest of the net catch for England and Wales has remained steady over the period 1960 to 1971. Severe reductions in the rod catches of the early-running two-sea-winter fish have continued in many rivers, but not in all. A factor in this decline may be the incidence of salmon disease (UDN). The counts of early-running two-sea-winter salmon in the River Coquet (Northumberland) have shown an overall decline since 1966 (but a slight increase in 1971) and have formed a decreasing proportion of the total years' runs of salmon and grilse in that river. The data from the River Axe (Devon), where a count is also made, show a decline in two-sea-winter fish over the last three years.

43. France. Though the catch cannot be given precisely, there are indications that the total catch of salmon and grilse has decreased in recent years, mainly due to a decrease in the salmon, particularly in the River Adour.

44. Iceland. The catch of salmon and grilse combined in 1971 (204 metric tons) was the highest yet recorded. Since 1960, annual catches have generally shown an upward trend, coinciding with a great increase in smolt rearing during that period.

45. Ireland. The total catch (salmon plus grilse) in 1971 was similar to that of previous years. However, there was a sharp decline in the salmon catch compared with 1970, which was the first year in which a breakdown was available into salmon and grilse. Some long-term statistics are available for a number of the major river systems and from these it is evident that the decline in early-run fish, which was first noticed in 1967, was much more marked in 1970 and 1971. There was a slight decrease in the grilse catch in 1971 but it was still well above the average for the decade in the major salmon rivers where a breakdown in statistics is available.

46. Northern Ireland. The commercial catch of salmon plus grilse in 1971 (including 50% of the Foyle total) was 234 metric tons. This is a decrease of 28% from the previous year's catch and represents 64% of the average for the period 1967-70.

47. Norway. The salmon plus grilse catch in 1971 (1 208 metric tons) was similar to the 1970 catch but the catches in both years were below those of all previous years since the early nineteen fifties. On a weight basis, the 1971 catch consisted of about 36% grilse and 64% salmon. Compared with 1970, the proportion of grilse had increased slightly.

48. Scotland. The total Scottish catch (salmon plus grilse) for 1971 was slightly less than in 1970. The salmon catch was substantially lower than in any year since 1952 and only about 65% of the 1952-70 average. The grilse catch was higher than in 1970 and was well above the long-term (1952-70) average.

49. Canada. The total home-water (salmon plus grilse) catch decreased by 263 metric tons in 1971 from the 1970 level. The Labrador portion of the catch increased by 180 metric tons, but there was a decrease of 440 metric tons in the other areas represented within the Canadian total catch. Landings from certain regions have shown major decreases, namely Quebec (57% of 1970 catch) and the Maritimes (48% of the 1970 catch). It will be noted that, since 1970, it has been possible to obtain more precise data on catch per unit effort for the major Atlantic salmon fisheries in the Maritime provinces of Canada (Table 13). The Working Party noted the serious decline in the Maritime and Quebec commercial and angling catches for 1971. The reduced runs of large salmon in the Miramichi and the resulting loss in potential egg deposition has prompted the Canadian Government to close the commercial

fishery and to impose severe restrictions on the sport fishery in this river in 1972, and for the next several years at least. Spawning escapement has been below that believed necessary for adequate seeding of the rivers since 1969 and the autumn portion of the Miramichi run, including both salmon and grilse, has virtually disappeared.

50. The total catch (salmon plus grilse) in 1971, was lower than in 1970 in all the main salmon producing countries except Norway, where it was about the same and Iceland where it was slightly higher.

51. Separate statistics for salmon and grilse catches have generally only been available for recent years but the salmon catches for some European countries, for the years 1969-71, shown below, show a substantial decline in these years.

Country	Salmon Catch (metric tons)		
	1969	1970	1971
England and Wales	264	313	299
Ireland	(260)	268	175
Norway	801	816	773
Scotland	987	802	715
	2 312	2 199	1 962

Further, in some countries (e.g. Ireland, Scotland) the decrease in salmon catch has been most marked in the early spring runs. The Canadian salmon catch was also lower in 1970 and 1971 than in 1969 (Table 12).

52. As indicated below the grilse catches for the European countries listed above also decreased overall between 1969 and 1970 and remained at about the 1970 level in 1971.

Country	Grilse Catch (metric tons)		
	1969	1970	1971
England and Wales	113	214	127
Ireland	1 470	1 519	1 464
Norway	582	355	435
Scotland	954	622	704
	3 119	2 710	2 730

E. FUTURE RESEARCH

1. International Tagging Experiment at West Greenland

53. The Working Party considered the Reports of the Planning Group for the International Tagging Experiment at West Greenland in 1972. It approved the proposed plans and budget for the experiment, and the arrangements proposed for its administration. They also approved the draft of the Guide Book and standard forms for research vessels and observers participating in the experiment.

54. The Working Party examined and approved a draft publicity pamphlet for the experiment and agreed that suitable allocations of copies of it should be supplied for distribution in Greenland and in those European and North American countries with an interest in the West Greenland fishery. It was also agreed that individual countries could purchase additional copies of the pamphlet, provided that they informed the ICES Secretariat about their requirements before the printing order was despatched. The Working Party also stressed the importance of additional publicity within countries through especially the press, radio and television.

55. The Working Party endorsed the arrangements, drawn up by the Planning Group, for handling and preliminary analysis of data from the Tagging Experiment, namely that Canada will be responsible for handling the research vessel catch and effort data, Denmark the tag return and the commercial fishery data and the United Kingdom the examination of all scale collections. It was also agreed that the ICES Hydrographer should be consulted about the analysis of hydrographic data collected during the Tagging Experiment.

56. It was agreed that, if possible, a film record of the experiment should be prepared and countries participating in the experiment were asked to implement this request.

2. Other Research

57. The Working Party drew attention to the importance of continuing studies on salmon stocks in home waters, in particular, to investigations of the exploitation rate in home waters, of the relationship between grilse and salmon and of the relationship between stock and recruitment and to the analysis of tag recaptures on a river system basis.

Table 1. Catches at West Greenland, 1960-71, in metric tons, round fresh weight.

Year	Drift Net				Gill Net and Drift Net	Total
	Norway	Faroes	Sweden	Denmark	Greenland ^{c)}	
1960	0	0	0	0	60	60
1961	0	0	0	0	127	127
1962	0	0	0	0	244	244
1963	0	0	0	0	466	466
1964	0	0	0	0	1 539	1 539
1965	-a)	36	0	0	825	861
1966	32	87	0	0	1 251	1 370
1967	78	155	0	85	1 283	1 601
1968	138	134	4	272	579	1 127
1969	250	215	30	355	1 360(385)	2 210
1970	270	259	8	358	1 244	2 146 ^{b)}
1971	340	255	0	645	1 449	2 689

- a) - Figures not available, but catch is known to be less than Faroes.
- b) - Including 7 metric tons caught on long line by one of two Greenland vessels in the northern Labrador Sea early in 1970.
- c) - Up to 1968, gill net only, after 1968 gill net and drift net. The figures in brackets for the 1969 catch are an estimate of the minimum drift net catch.

Table 2. Number of natural (wild) smolts tagged in the years 1963-71 and recaptured in West Greenland and in other areas, including home waters, up to March 1972. Figures in brackets are returns per thousand tagged.

Country	Year of Tagging	Number Tagged	R e c a p t u r e s					
			West Greenland	Norwegian Sea and Faroes	All Other Areas			Grand Total
					Grilse	Salmon	Total	
Canada	1963	5 850	11 (1.9)	0	70	20 (3.4)	90	101
	1964	15 013	9 (0.6)	0	204	72 (4.8)	276	285
	1965	16 485	73 (4.4)	0	175	193 (11.7)	368	441
	1966	9 509	25 (2.6)	0	120	104 (10.9)	224	249
	1967	17 809	17 (1.0)	0	121	166 (9.3)	287	304
	1968	55 784	127 (2.3)	0	1 209	429 (7.7)	1 637	1 764
	1969	42 879	84 (2.0)	0	374	183 (4.3)	551	635
	1970	37 124	141 (3.8)	0	291	-	(291)	(432)
	1971	45 733	-	-	-	-	-	-
Scotland	1963	10 998	10 (0.9)	0	172	92 (8.4)	264	274
	1964	9 200	6 (0.7)	0	110	66 (7.2)	176	182
	1965	9 239	10 (1.1)	0	74	49 (5.3)	123	133
	1966	15 406	30 (1.9)	0	281	39 (2.5)	320	350
	1967	21 002	23 (1.1)	1	169	71 (3.4)	240	264
	1968	15 695	16 (1.0)	0	127	32 (2.0)	159	175
	1969	15 958	53 (3.3)	0	220	60 (3.8)	280	333
	1970	32 071	144 (4.5)	2a)	565	-	(565)	(711)
	1971	20 706	-	-	-	-	-	-
England and Wales	1963	9 485	8 (0.8)	0	15	38 (4.0)	53	61
	1964	17 129	10 (0.6)	0	30	97 (5.7)	127	137
	1965	5,873	12 (2.0)	0	35	57 (9.7)	92	104
	1966	3 219	5 (1.6)	0	28	37 (11.5)	65	70
	1967	4 118	10 (2.4)	0	23	56 (13.6)	79	89
	1968	5 790	23 (3.9)	0	43	48 (8.3)	91	114
	1969	8 611	47 (5.4)	0	27	38 (4.4)	65	112
	1970	7 320	22 (3.0)	0	30	-	(30)	52
	1971	5 619	-	-	-	-	-	-
Norway	1963	97	0	0	0	4 (41.2)	4	4
	1964	1 485	0	0	67	26 (17.5)	93	93
	1965	2 178	0	0	40	18 (8.3)	58	58
	1966	1 362	0	2	27	16 (11.7)	43	45
	1967	3 601	0	4	59	29 (8.0)	88	96*
	1968	3 562	0	3	106	17 (4.8)	124	131*
	1969	4 273	3 (0.7)	3	83	26 (6.1)	109	120*
	1970	7 603	2 (0.3)	2	224	-	(224)	(228)
	1971	5 573	-	-	-	-	-	-
Iceland	1963	63	0	0	2	0	2	2
	1964	63	0	0	0	1 (15.9)	1	1
	1965	8	0	0	0	0	0	0
	1966	83	0	-	-	2 (24.0)	2	2
	1967	154	0	-	2	1 (6.5)	3	3
	1968	59	0	-	1	1 (17.0)	2	2
	1969	15	0	-	-	-	-	-
	1970	16	0	-	-	-	-	-
Ireland	1968	606	0	0	21	0	21	21
	1969	0	0	0	0	0	0	0
	1970	1 522	4 (2.6)	-	1	-	1	5

(ctd)

Table 2 - continued

Country	Year of Tagging	Number Tagged	R e c a p t u r e s					Grand Total
			West Greenland	Norwegian Sea and Faroes	All Other Areas			
					Grilse	Salmon	Total	
Sweden	1969	885	0	0	69	16 (18.0)	85	85
USSR	1969	500	0	0	0	0	0	0
France	1969	2 089	15 {7.1}	-	0	4 {1.9}	4	19
	1970	3 807	26 {6.8}	-	3	10 {2.6}	13	39
	1971	4 702	-	-	-	-	-	-
Greenland	1970	154 ^{b)}	7 (45.5)	0	0	0	0	7
	1971	136 ^{b)}	-	-	-	-	-	-

* - Including some fish from unknown localities.

a) - One from Norwegian coast and one reported from France as having been received from Norway.

b) - Wild parr.

Table 3. Number of hatchery-reared smolts tagged in the years 1963-71 and recaptured in West Greenland and in other areas, including home waters, up to March 1972. Figures in brackets are returns per thousand tagged.

Country	Year of Tagging	Number Tagged	Recaptures						Grand Total
			West Greenland	Norwegian Sea and Faroes	All Other Areas				
					Grilse	Salmon	Total		
Canada	1963	17 332	4 (0.5)	0	133	32 (4.4)	165	169	
	1964	46 659	9 (0.2)	0	101	85 (1.8)	186	195	
	1965	45 988	67 (1.5)	0	379	224 (4.9)	603	670	
	1966	70 875	70 (1.0)	0	238	301 (4.3)	539	609	
	1967	112 288	68 (0.6)	0	278	227 (2.0)	505	573	
	1968	113 368	189 (1.7)	0	302	332 (2.9)	634	823	
	1969	137 832	256 (1.9)	0	366	243 (1.8)	609	865	
	1970	184 962	194 (1.0)	0	294	-	(294)	(488)	
	1971	200 689	-	-	-	-	-	-	
Scotland	1963	6 750	0	0	3	3 (0.4)	6	6	
	1964	3 000	0	0	7	7 (2.3)	14	14	
	1965	3 000	0	0	19	0	19	19	
	1966	8 000	1 (0.1)	0	13	5 (0.6)	18	19	
	1967	4 451	0	0	1	0	1	1	
	1968	5 335	0	0	4	1 (0.2)	5	5	
	1969	3 694	0	0	1	0	1	1	
	1970	7 836	9 (1.1)	2a)	33	-	(33)	(44)	
	1971	5 247	-	-	-	-	-	-	
England and Wales	1963	1 970	1 (0.5)	0	0	0	0	1	
	1964	0	0	0	0	0	0	0	
	1965	0	0	0	0	0	0	0	
	1966	9 668	0	0	0	1 (0.1)	1	1	
	1967	18 522	0	0	0	1 (0.1)	1	1	
	1968	28 266	4 (0.1)	0	4	5 (0.2)	9	13	
	1969	7 420	1 (0.1)	0	4	0	4	5	
	1970	4 493	3 (0.7)	0	0	-	-	3	
	1971	11 346	-	-	-	-	-	-	
Norway	1963	10 999	0	1	88	95 (8.6)	183	184	
	1964	9 182	0	1	135	87 (9.5)	222	223	
	1965	8 071	0	13	71	33 (4.1)	104	117	
	1966	13 812	0	29	403	145 (10.5)	548	593*	
	1967	18 393	2 (0.1)	50	229	81 (4.4)	310	386*	
	1968	12 983	0	44	171	103 (7.9)	274	343*	
	1969	16 967	4 (0.2)	38	138	68 (4.0)	206	260*	
	1970	18 673	2 (0.1)	3	170	-	(170)	(175)*	
	1971	16 777	-	-	-	-	-	-	
Iceland	1966	8 367	1 (0.1)	1(0.1)	66	14 (1.7)	80	82	
	1967	10 061	0	0	24	6 (0.6)	30	30	
	1968	9 985	0	0	45	0	45	45	
	1969	7 586	0	0	246	10 (1.3)	256	256	
	1970	10 014	0	0	1	-	-	1	
	1971	11 087	-	-	-	-	-	-	
Ireland	1966	15 000	0	0	0	0	0	0	
	1967	5 000	1 (0.2)	0	1	0	1	2	
	1968	222	0	0	1	0	1	1	
	1969	7 194	2 (0.3)	0	21	1 (0.2)	22	24	
	1970	3 787	0	1	11	0	(11)	(12)	
	1971	2 381	-	-	-	-	-	-	

(ctd)

Table 3 (ctd)

Country	Year of Tagging	Number Tagged	Recaptures					Grand Total
			West Greenland	Norwegian Sea and Faroes	All Other Areas			
					Grilse	Salmon	Total	
Sweden	1966	11 181	7 (0.6)	1	690	193 (17.2)	883	891
	1967	4 999	1 (0.2)	4	364	62 (12.4)	426	431
	1968	4 798	1 (0.2)	1	586	37 (7.7)	623	625
	1969	7 381	2 (0.3)	0	514	9 (1.2)	523	523
	1970	5 000	6 (1.2)	0	293	-	(293)	(299)
	1971	4 997	-	-	-	-	-	-
USA	1966	82 250	39 (0.4)	0	69	168 (2.0)	237	276
	1967	80 717	1	0	12	10 (0.1)	22	23
	1968	73 730	7 (0.1)	0	9	12 (0.2)	21	28
	1969	73 418	65 (0.9)	0	32	80 (1.1)	112	177
	1970	48 190	382 (7.9)	0	57	-	(57)	(439)
	1971	29 905	-	-	-	-	-	-
Denmark	1965	1 880	0	0	1	2 (1.1)	3	3
	1966	4 270	0	3	19	47 (11.0)	66	69
	1967	2 696	0	1	13	10 (3.7)	23	24
	1968	5 173	1 (0.2)	1	36	0	36	38
	1969	3 837	0	0	5	0	5	5
	1970	1 376	0	0	0	-	0	0
USSR	1969	600	-	-	-	-	-	-

* - Including some fish from unknown localities.

a) - Norwegian coast.

Table 4. Number of kelts tagged in the winters 1962/63 - 1971/72 and recaptured in Greenland and other areas, including home waters, up to the end of 1971.

Country	Winter of Tagging	Number Tagged	Recaptures		
			Greenland	Other Areas	Total
Canada ^{a)}	1962-63	653	2	65	67
	1963-64	1 518	0	91	91
	1964-65	1 995	1	141	142
	1965-66	7 169	0	653	653
	1966-67	7 510	1	688	689
	1967-68	3 710	2	399	401
	1968-69	3 848	5	165	170
	1969-70	4 726	9	207	216
	1970-71	5 392	22	401	423
	1971-72	5 142	-	-	-
England and Wales (River Axe only)	1962-63	159	1	12	13
	1963-64	185	2	10	12
	1964-65	184	1	11	12
	1965-66	109 ^{b)}	1	7	8
	1966-67	178 ^{b)}	1	11	12
	1967-68	188	2	6	8
	1968-69	81	0	3	3
	1969-70	113	0	12	12
	1970-71	7	0	0	0
Faroes	1970-71	24	0	0	0
Iceland	1962-63	114	0	14	14
	1963-64	167	0	9	9
	1964-65	154	0	5	5
	1965-66	357	0	15	15
	1966-67	745	0	75	75
	1967-68	441	0	17	17
	1968-69	369	0	19	19
	1969-70	314	0	21	21
	1970-71	785	0	105	105
Ireland	1962-63	2 264	2	31	33
	1963-64	2 351	2	70	72
	1964-65	2 695	2	34	36
	1965-66	2 972	1	40	41
	1966-67	3 175	0	77	77
	1967-68	1 034	0	24	24
	1968-69	498	0	10	10
	1969-70	1 088	0	28	28
	1970-71	477	0	39	39
Scotland	1962-63	413	1	2	3
	1963-64	134	0	2	2
	1964-65	233	0	6	6
	1965-66	1 376	4	19	23
	1966-67	901	3	18	21
	1967-68	117	0	3 ^{c)}	3
	1968-69	152	0	1 ^{d)}	1
	1969-70	153	0	1	1
	1970-71	?	0	1	1

(ctd)

Table 4 (ctd)

Country	Winter of Tagging	Number Tagged	Recaptures		
			Greenland	Other Areas	Total
USA	1962-63	151	1	13	14
	1963-64	123	1	10	11
	1964-65	160	0	23	23
	1965-66	146	2	16	18
	1966-67	578	5	75	80
	1967-68	340	5	56	61
	1968-69	218	1	16	17
	1969-70	315	1	16	17
	1970-71	400	2	18	20
	1971-72	240	-	-	-
USSR	1968-69	566	0	10	10
	1969-70	1 147	0	0	0

- a) - Ascending adults tagged during any year are included in the totals tagged for the corresponding winter (i.e. those tagged in 1962 are included under 1962-63, those tagged in 1963 under 1963-64 etc.), but recaptures of these adults in the year of tagging have not been included.
- b) - In addition, 180 kelts were tagged by the Dee and Clwyd River Authority in 1965-66 and 291 kelts in 1966-67. No recaptures were reported from the first experiment and two (from 'Other Areas') from the second.
- c) - Includes 1 recapture at Faroes.
- d) - Recaptured at Faroes.

Table 5. Recaptures (to March 1972) of fish tagged at West Greenland and in the Labrador Sea.

Year Tagged	Number Tagged	Local Recaptures		Distant Recaptures	
		Number	Days Absence	Number	Location
1965	223	3	1, 3, 26	1	Canada (SW Newfoundland)
1966	729	28	1-8 (24) 10-50 (4)	4	Canada (Miramichi - 1) Scotland (River Tweed - 2) (River Spey - 1)
1967	375	6	1-2 (3) not known (3)	4	Canada (Labrador - 1) Ireland (River Slaney - 1) (River Barrow - 1) Scotland (River Tay - 1)
1968	47	4	1-3 (3) 1 month (1)	1	Canada (Labrador)
1969	444	14 3 ^{b)}	4-35 days 340-398 days	13	Canada (Labrador - 1) (NE Newfoundland - 4 ^{a)}) (Miramichi - 1) England (Taw & Torridge Estuary - 1) (River Wye - 1) Ireland (Waterville - 1) (River Slaney - 1) Scotland (near Montrose - 1) Spain (River Ason - 1) Wales (River Teify - 1)
1970	27 ^{c)}	0	-	3	Canada (Chaleur Bay - 1) (River St. Jean - 1) (Escuminac - 1)
	224	3	4-22 days	4	Canada (Labrador - 1) (Nova Scotia - 1) Ireland (Dunmore East - 1) Scotland (Solway Firth - 1)
1971	59 ^{c)}	0	-	8	Canada (NE Newfoundland - 6) (Chaleur Bay - 2)
	226	5	1 - ca. 30	1	England (River Taw)

a) - One recaptured in year of tagging.

b) - Recaptured at Greenland in 1970.

c) - Labrador Sea in spring.

Table 6. Simulation of home waters catches, natural losses and proportions of home water salmon not present at West Greenland, based on ranges of values of exploitation rate at West Greenland, weight increase between West Greenland and home waters and exploitation rates in home waters.

Catch at West Greenland	Exploitation Rate at West Greenland(%)	Numbers in West Greenland Stock escaping Fishery at West Greenland	Weight Increase between West Greenland and Home Waters (%)	Home Water Exploitation rate	Simulated Home Water Catch in Canada + the UK (Metric tons) ^{a)}	Minimum Loss between West Greenland and Home Waters as % of numbers escaping fishery at W.Greenland ^{b)}	Minimum Proportion of Home Water Salmon catches (Canada + UK) based on non-Greenlandic fish in % of actual Catch ^{c)}
2 000 m. Tons; 625 000 Fish	10	5 625 000	25	50	9 000	61	-
				65	11 700	70	-
				80	14 400	76	-
			50	50	10 800	68	-
				65	14 040	75	-
				80	17 280	80	-
	20	2 500 000	25	50	4 000	13	-
				65	5 200	33	-
				80	6 400	45	-
			50	50	4 800	27	-
				65	6 240	44	-
				80	7 680	54	-
	30	1 458 000	25	50	2 333	-	33
				65	3 033	-	13
				80	3 733	6	-
			50	50	2 799	-	20
				65	3 639	4	-
				80	4 479	22	-

a) - It is assumed that 80% of salmon present at West Greenland are destined for Canada and the UK combined. The actual recorded catches of salmon in Canada and the UK is taken as about 3 500 metric tons.

b) - The losses are minimum, because it is supposed that all salmon caught in home waters have been in the West Greenland stock.

c) - The proportion is minimum, because no natural mortality between Greenland and home waters is taken into account.

Table 7. Catches in the Norwegian Sea long-line fishery and in the drift net fishery within Norwegian fishery limits, 1965-71. Metric tons, round fresh weight.

Year	NORWEGIAN SEA LONG-LINE FISHERY												Drift-Net Fishery within Norwegian Fishery Limits
	Denmark		Faroes		Germany, F.R.		Norway		Sweden		Total		
	Number of Vessels	Catch	Number of Vessels	Catch	Number of Vessels	Catch	Number of Vessels	Catch	Number of Vessels	Catch	Number of Vessels	Catch	
1965	1-2	-a)	0	0	0	0	?e)	0	0	0	1-2	-a)	283
1966	10	-a)	0	0	0	0	"	0	-a)	-a)	10+	-a)	312
1967	22	77	0	0	0	0	"	-a)	6	-a)	28+	77+	333
1968	28	177	2	5 ^{b)}	0	0	"	100 ^{d)}	16	126	46+	408 ^{d)}	228
1969	40	413	4	7 ^{c)}	5	24	"	450 ^{d)}	2	24	51+	918 ^{d)}	234
1970	60	481	5	12 ^{b)}	4	21	"	420 ^{d)}	1	24	70+	958 ^{d)}	183
1971	20	162	0	0	2	9	"	300 ^{d)}	1	17	23+	488 ^{d)} f)	263

a) - Not known.

b) - Roughly 70% of catch taken in the vicinity of Faroes.

c) - All taken in the vicinity of Faroes.

d) - Estimated catch.

e) - Precise number unknown, but large numbers of small and medium-sized vessels participated.

f) - Excluding catches discarded because undersized.

Table 8. Estimates of catch per unit effort in the Norwegian Sea long-line fishery 1968-71.

Year	Country	No. of Salmon/1 000 Hooks caught in:						No. of Salmon Sampled
		Feb	Mar	Apr	May	Jun	Total Season	
1968	Denmark			92	100			5 539
1969	Denmark		43	57	44	29	39	25 891
	Germany FR			50	46	23	42	5 459
	Faroe			79 ^{a)}				
1970	Denmark	42	50	67	35	27	49	72 000
	Germany FR			66	35	16	46	6 313
	Faroe			40 ^{a)}				366
1971	Denmark				42 ^{b)}	25 ^{b)}		31 105
	Germany FR		72 ^{c)}					
	Faroe		82 ^{a)}	39 ^{a)}			60 ^{a)}	499

- a) - Research catch, 20-80 nautical miles NE of Faroe Islands.
b) - Including catches discarded because undersized.
c) - Research catch.

Table 9. Recaptures of Salmon tagged in the long-line fishery in the Norwegian Sea (to March 1972).

Year Tagged	Number Tagged	Year Recaptured	R e c a p t u r e s			
			Norwegian Sea	H o m e W a t e r		Total
				Norway	U.S.S.R.	
1968	238	1968	0	5	0	5
		1969	0	0	1	1
		Total	0	5	1	6
1969	932	1969	5	49	6	60
		1970	2	13	2	17
		1971	0	2	0	2
		Total	7	64	8	79
1970	1 118	1970	10	117	8	135
		1971	2	10	3	15
		Total	12	127	11	150
1971	1 824	1971	4	135	17	156

Table 10. Recaptures of fish tagged in Faroe waters.

Year Tagged	Number Tagged	R e c a p t u r e s					
		Norway	England	Scotland	Ireland	U.S.S.R.	West Greenland
1969	74	1	0	2	0	0	0
1970	233	2	1	5	3	1	1
1971	359	3	1	8	2	0	1

Table 11. Simulation of catches of two-sea-wintersalmon in the Norwegian home waters; estimation of natural losses and proportion of the Norwegian stock not present in the Norwegian Sea, for different values of main parameters.

Norwegian Sea Offshore Catch (m. tons)	Offshore Exploitation Rate (%)	Surviving Offshore Stock (m.tons)	Weight Increase (%)	Home Waters Exploitation		Estimated Norwegian Catch for Proportion returning to Norway		Estimated Natural Loss		Estimated Proportion of Norwegian Salmon not pre- sent in fished Area	
				%	m.tons	80%	90%	80%	90%	80%	90%
1 000	40	1 500	20 (1 800 m.tons)	50	900	720	870	-	7	10	-
				80	1 440	1 152	1 296	31	38	-	-
			30 (1 950 m.tons)	50	975	780	877	-	10	3	-
				80	1 560	1 248	1 404	36	45	-	-
	50	1 000	20 (1 200 m.tons)	50	600	480	540	-	-	40	33
				80	960	768	864	-	7	4	-
			30 (1 300 m.tons)	50	650	520	585	-	-	35	27
				80	1 040	832	936	3	14	-	-

Table 12. Catches in home waters, 1960-71 (salmon plus grilse except where shown separately) in metric tons, round fresh weight.

Year	England and Wales			France	Iceland	Ireland ^{b)}			Northern ^{b)} Ireland	Norway			Scotland			Sweden ^{c)}	USSR ^{e)}	Canada			USA
	S ^{a)}	G ^{a)}	T	T	T	S	G	T	T	S	G	T	S	G	T	T	T	S	G	T	T
1960	-	-	283	50-100	100	-	-	743	139	-	-	1 659 ^{f)}	950	476	1 436	40	1 100	-	-	1 635	< 2
1961	-	-	232	50-100	127	-	-	707	132	-	-	1 533 ^{f)}	820	376	1 196	27	790	-	-	1 580	< 2
1962	-	-	318	50-100	125	-	-	1 459	356	-	-	1 935 ^{f)}	1 015	725	1 740	15	710	-	-	1 717	< 2
1963	-	-	325	50-100	145	-	-	1 458	306	-	-	1 786 ^{f)}	1 286	412	1 698	16	480	-	-	1 848	< 2
1964	-	-	307	50-100	135	-	-	1 617	377	-	-	2 147 ^{f)}	1 216	698	1 914	16	590	-	-	2 066	< 2
1965	-	-	320	50-100	133	-	-	1 457	281	-	-	2 000 ^{f)}	1 042	560	1 602	17	590	-	-	2 113	< 2
1966	-	-	387	50-100	106	-	-	1 238	287	-	-	1 791	1 069	555	1 624	17	570	-	-	2 356	< 2
1967	-	-	420	50-100	146	-	-	1 463	449	-	-	1 960	1 245	888	2 133	23	883	-	-	2 859	< 2
1968	-	-	282	50-100	162	-	-	1 413	312	-	-	1 514	1 020	543	1 563	14	827	-	-	2 104	< 2
1969	264 ^{a)}	113 ^{a)}	377	50-100	133	(260) ^{g)}	(1 470) ^{g)}	1 730	267	801	582	1 383	987	954	1 941	9	360	1 546 ^{a)}	411 ^{a)}	1 957	< 2
1970	313 ^{a)}	214 ^{a)}	527	50-100	195	268	1 519	1 787	297	816	355	1 171	802	622	1 424	?	?	1 468 ^{a)}	629 ^{a)}	2 097	< 2
1971	299	127	426	50-100	204	175	1 464	1 639	234	773	435	1 208	715	704	1 419	56	?	1 440 ^{a)}	394 ^{a)}	1 834	< 2
Angling Catch	Included			Inc.	Inc.	Inc.			Inc.	Inc.			Inc.			Not inc.	Inc.	Not inc. ^{d)}			Inc.

S - Salmon; G - Grilse; T - Total (Salmon plus Grilse)

a) - Estimated.

b) - Catch in River Foyle allocated on basis of 50% Ireland and 50% Northern Ireland.

c) - West Coast catch only, from "Bulletin Statistique".

d) - Angling catches (mainly grilse) about 10% additional (by weight).

e) - Mainly salmon.

f) - Including sea trout and sea char catches; less than 5% of total.

g) - Estimated on basis of 1970 catches.

Table 13. Estimates of catches per unit effort for some home water fisheries.

Year	Canada			Ireland			Norway ^{d)}	England and Wales		Scotland			
	(Drift Nets and Traps) ^{a)} (lbs)	Trap Nets ^{h)}	Drift Nets ^{h)}	(Open Sea Drift Nets) ^{b)} (numbers)	(Licences) ^{c)} (lbs)	(Estuary Drift Nets) ^{b)} (numbers)	(Bag Nets) (kg)	Drift Nets NE Area ^{g)} (numbers)		(Fixed Engines) ^{e)} (numbers)	(Net and Coble) ^{f)} (numbers)		
								Salmon	Grilse	Salmon	Grilse	Salmon	Grilse
1960	169	-	-	325	950	104	172	84.8	79.8	12.8	20.3	84.1	77.4
1961	159	-	-	224	1 030	-	158	54.3	46.1	12.3	17.2	60.9	61.4
1962	178	-	-	563	2 210	297	175	92.8	75.5	14.8	29.6	83.6	134.9
1963	193	-	-	456	1 940	334	177	49.4	42.7	19.9	21.8	109.3	62.3
1964	266	-	-	430	1 720	392	195	52.6	58.0	23.2	35.6	98.6	113.8
1965	262	-	-	520	1 700	361	172	83.6	47.9	17.8	26.6	84.0	99.0
1966	245	-	-	516	1 250	375	154	66.6	58.9	19.4	30.4	95.0	104.0
1967	300	-	-	733	1 650	524	154	110.5	90.9	21.6	49.9	130.2	170.4
1968	183	-	-	552	1 650	482	129	-	-	17.3	29.8	97.9	92.4
1969	159	-	-	491	2 077	404	137	134.5	166.5	15.9	49.7	123.4	194.5
1970	153	13.3	85.9	422	1 899	565	117	170.3	245.3	12.3	35.2	98.9	137.5
1971	80	8.4	50.2	420	1 683	353	116	84.1	83.4	11.6	39.9	69.5	118.4

a) - Miramichi area, salmon only. Average of mean monthly catch/unit effort for both types of gear throughout open seasons for each type. Units of effort taken as 1 trap net or 200 fathoms of drift net, as defined in FRB Tech. Rep. No.29.

b) - Salmon and grilse per drift net.

c) - Pounds salmon and grilse per licence.

d) - Salmon and grilse per bag net.

e) - Catch per net per month.

f) - Catch per crew per month.

g) - Catch per net licence issued.

h) - Miramichi area, salmon only, pounds/unit day.

APPENDIX 1

1. Resolution adopted at the ICNAF Meeting in 1970 concerning Regulation of Salmon Fishing

Recognizing that the proposal adopted at the 1969 Annual Meeting for the prohibition of the fishery for salmon outside national fishery limits, not having been accepted by all Contracting Governments, has not been fully effective;

Considering that interim measures are desirable in order to avoid the escalation of fishing for salmon throughout the Convention Area pending a more accurate assessment of its effects on coastal and river fisheries and on the stocks; and

Noting that Contracting Governments which have not participated in the fishery have no present intention of so doing;

The Commission also proposes:-

1. That each Contracting Government which has participated in the fishery for Atlantic salmon, Salmo salar L., take appropriate action to limit the aggregate tonnage of vessels employed or catch taken by its nationals in the fishery in the Convention Area to a level not exceeding the aggregate tonnage of vessels so employed or catch so taken in 1969.
2. That Contracting Governments which have not accepted the prohibition on fishing for Atlantic salmon outside national fishery limits take appropriate action to prohibit fishing for Atlantic salmon outside national fishery limits in the Convention Area before 31 July and after 30 November.
3. That the use for salmon fishing of any trawl net, any monofilament net or any troll be prohibited throughout the Convention Area provided that Contracting Governments may authorize the continued use of monofilament nets acquired before 1 July 1970.
4. That these measures be in force for the year 1971 subject to review within that period, in the event of substantial changes in the catches of Atlantic salmon in the Convention Area or in home waters or in the fish stocks.

APPENDIX 2

2. Resolution adopted at the NEAFC Meeting in 1970 concerning Regulation of Salmon Fishing

"Fishing for salmon shall be regulated by the following measures as provided for in Article 7(1) of the Convention.

1. Closed Season Art. 7(1)(c)

In Regions 1 and 2 of the Convention Area, outside national fishery limits, fishing for salmon shall be prohibited from July 1 to May 5, both dates inclusive.

Where salmon occurs within the national fishery limits of Contracting States, those States shall prescribe annual closed seasons during which fishing for salmon shall be prohibited.

2. Minimum size for Salmon Art. 7(1)(b)

No salmon of a size less than 60 cm, measured from the tip of the snout to the end of the tail fin shall be retained on board, but shall be returned immediately to the sea.

3. Mesh of Nets Art. 7(1)(a)

Drift nets, anchored nets and seines used for fishing of salmon shall have a minimum mesh size of 160 mm. The mesh size is to be measured in accordance with the mesh regulations already in force under Recommendation (1).

4. Other Measures for the Regulation of Fishing Gear Art. 7(1)(e)

In the fishery for salmon

- a) any hooks used shall have a gape of not less than 1.9 cm;
- b) the leader attaching the hook to the line shall have a minimum strength comparable to 0.6 monofil nylon;
- c) the use of any trawl net, any monofilament net, or any troll shall be prohibited.

5. Closed Areas Art. 7(1)(d)

Fishing for salmon in the Convention Area, outside national fishery limits, shall be prohibited:

- a) between latitudes 63° and 68°N and east of longitude 0°;
- b) east of longitude 22°E.

The regulations under 2, 3 and 4 shall apply within the whole Convention Area, but outside national fishery limits.

This regulation for salmon fisheries shall enter into force on 1 January 1971 and shall be subject to review by the Commission after two years or in any case if substantial changes occur in the catches of salmon on the high seas or in home waters, or in the fish stocks.

In addition to making this Recommendation, the Commission agreed to urge all Contracting States fishing for salmon on the high seas only to participate in the planting of smolts".

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APPENDIX 3

List of Working Papers (1971-72)

1971 Meeting

1. Catch statistics and age/length distribution of Atlantic salmon from the southern part of the Davis Strait, by Per Kanneworff. (ICES/ICNAF Salmon Doc. 70/19).
2. The Danish drift net fishery for salmon in West Greenland, 1970, by J Møller Jensen. (ICES/ICNAF Salmon Doc. 71/5).
3. Length and age distribution of Atlantic salmon from the offshore fishery at West Greenland 1970, by J Møller Jensen. (ICES/ICNAF Salmon Doc. 71/4).
4. The size composition of salmon landed during the autumn 1969 in Fiskenaesset, Div. 1D, West Greenland, by J Møller Jensen. (ICES/ICNAF Salmon Doc. 71/6).
5. Size and age data for Atlantic salmon from West Greenland and Canadian fisheries, by A W May. (ICES/ICNAF Salmon Doc. 71/7).
6. A report on the salmon scale samples collected by the Danish research vessel "Tornak" in 1969, by DAFS, Pitlochry. (ICES/ICNAF Salmon Doc. 71/8).
7. Observations on selectivity and relative efficiency of salmon drift nets in connection with population studies on salmon at West Greenland, by O Christensen. (ICES/ICNAF Salmon Doc. 71/9).
8. Canadian drift net fishing and tagging of Atlantic salmon in the Labrador Sea and at West Greenland in 1970, by A W May. (ICES/ICNAF Salmon Doc. 71/10).
9. West coast of Greenland. Inshore gill netting and tagging of salmon, "Tornak", 1970, by A Swain. (ICES/ICNAF Salmon Doc. 71/11).
10. Greenland salmon research programme, 1970, "Adolf Jensen", by W R Munro. (ICES/ICNAF Salmon Doc. 71/12).
11. Techniques to identify continental origin of salmon caught at sea, by O L Nyman and J H C Pippy. (ICES/ICNAF Salmon Doc. 71/2).
12. Continental origin of Atlantic salmon from West Greenland and the Labrador Sea in 1970, by O L Nyman, A W May and A L Meister. (ICES/ICNAF Salmon Doc. 71/3).
13. Food and feeding of Atlantic salmon at sea, by W H Lear. (ICES/ICNAF Salmon Doc. 71/1).
14. Notes on recent research progress at the MAFF Salmon and Freshwater Fisheries Laboratory Population Genetics Unit, by R Payne. (ICES/ICNAF Salmon Doc. 71/13).
15. Summary of recaptures of salmon tags from USA stocks in ICNAF waters, by A L Meister. (ICES/ICNAF Salmon Doc. 71/14).
16. A report on recaptures from a 1968 native salmon smolt tagging project on the Miramichi River, by Gary E Turner. (ICES/ICNAF Salmon Doc. 71/15).

17. On the interrelationship between some parameters used for assessing the effects of the West Greenland salmon fishery, by Sv Aa Horsted. (ICES/ICNAF Salmon Doc. 71/16).
18. The Danish salmon fishery in the Norwegian Sea in 1970, by O Christensen. (ICES/ICNAF Salmon Doc. 71/18).
19. Report on a salmon long-lining cruise off the Faroes during April 1970, by G Struthers. (ICES/ICNAF Salmon Doc. 71/19).
20. Salmon catches for England and Wales (including grilse), by MAFF, London. (ICES/ICNAF Salmon Doc. 71/25).
21. Scottish salmon catch statistics, 1952-1969, by W R Munro. (ICES/ICNAF Salmon Doc. 71/20).
22. The length, weight and age composition of the commercial catches from the Rivers Tweed, Tay and Spey in 1969, by W R Munro and I J R Hynd. (ICES/ICNAF Salmon Doc. 71/21).
23. The length, weight and age composition of the commercial catches from the Rivers Tweed, Tay and Spey in 1969, by W R Munro and I J R Hynd. (ICES/ICNAF Salmon Doc. 71/22).
24. The length, weight and age composition of the salmon catch of the North Esk (Scotland) from 1967 to 1970 and the estimated number of two-sea-winter salmon occurring in the catches from 1962-1970, by W M Shearer. (ICES/ICNAF Salmon Doc. 71/23).
25. Methods of estimating Atlantic salmon catch per unit effort for the Maritime Provinces of Canada, by Colin E Wykes. (ICES/ICNAF Salmon Doc. 71/24).

1972 Meeting

1. Greenland salmon research programme, 1971 - "Adolf Jensen", by W R Munro. (ICES/ICNAF Salmon Doc. 72/65).
2. Scottish salmon catch statistics, by W R Munro. (ICES/ICNAF Salmon Doc. 72/66).
3. Sex ratios of North Esk salmon in relation to age, by W M Shearer. (ICES/ICNAF Salmon Doc. 72/67).
4. Summary of salmon parasite investigations 1970-71, by J H C Pippy. (ICES/ICNAF Salmon Doc. 72/68).
5. First estimates of 'salmon' versus grilse quantities in Canadian commercial catches, 1969 and 1970, by A W May and W H Lear. (ICES/ICNAF Salmon Doc. 72/69).
6. Preliminary observations on differences in fishery contributions of hatchery-reared Atlantic salmon (Salmo salar) smolts related to stock selection and release location, by J A Ritter and D B Lister. (ICES/ICNAF Salmon Doc. 72/70).
7. Exploitation of Miramichi Atlantic salmon based on smolts tagged in 1968, 1969 and 1970, by G E Turner. (ICES/ICNAF Salmon Doc. 72/71).

8. Percentage of female salmon in the upstream migrations on the River Axe, Devon, by MAFF London. (ICES/ICNAF Salmon Doc. 72/72).
9. Salmon catches for England and Wales, by A Swain. (ICES/ICNAF Salmon Doc. 72/73).
10. The derivation by analysis of covariance of indices of total migrant population size from angling catch returns from the River Wye, by A S Champion. (ICES/ICNAF Salmon Doc. 72/74).
11. Geographical and seasonal distribution of the Danish offshore salmon fishery at West Greenland in 1971, by O Christensen. (ICES/ICNAF Salmon Doc. 72/75).
12. The Danish salmon fishery in the Norwegian Sea in 1971, by O Christensen. (ICES Doc. C.M.1972/M:3).
13. The Faroese offshore fishery for salmon at West Greenland 1971, by A Reinert. (ICES/ICNAF Salmon Doc. 72/76).
14. The size composition and growth rate of salmon landed in West Greenland during the autumn, 1970, by J Møller Jensen. (ICES/ICNAF Salmon Doc. 72/77).
15. Grilse salmon relationship in two Irish rivers, by Eileen Twomey. (ICES/ICNAF Salmon Doc. 72/78).
16. Catches in 1971 and their seasonal break-down, by Eileen Twomey. (ICES/ICNAF Salmon Doc. 72/79).
17. Rates of exploitation in Irish waters, by Eileen Twomey. (ICES/ICNAF Salmon Doc. 72/80).
18. Use of scales to determine mainland origin of Atlantic salmon caught in offshore waters, by K H Mosher. (ICES/ICNAF Salmon Doc. 72/81).
19. Distant and local exploitation of a Labrador Atlantic salmon population by commercial fisheries, by R F Peet and J D Pratt. (ICES/ICNAF Salmon Doc. 72/82).
20. Overfishing and depleted stocks of Northwest Miramichi salmon, by P F Elson. (ICES/ICNAF Salmon Doc. 72/83).

Fig.1

DISTRIBUTION OF WEST GREENLAND SALMON FISHERY

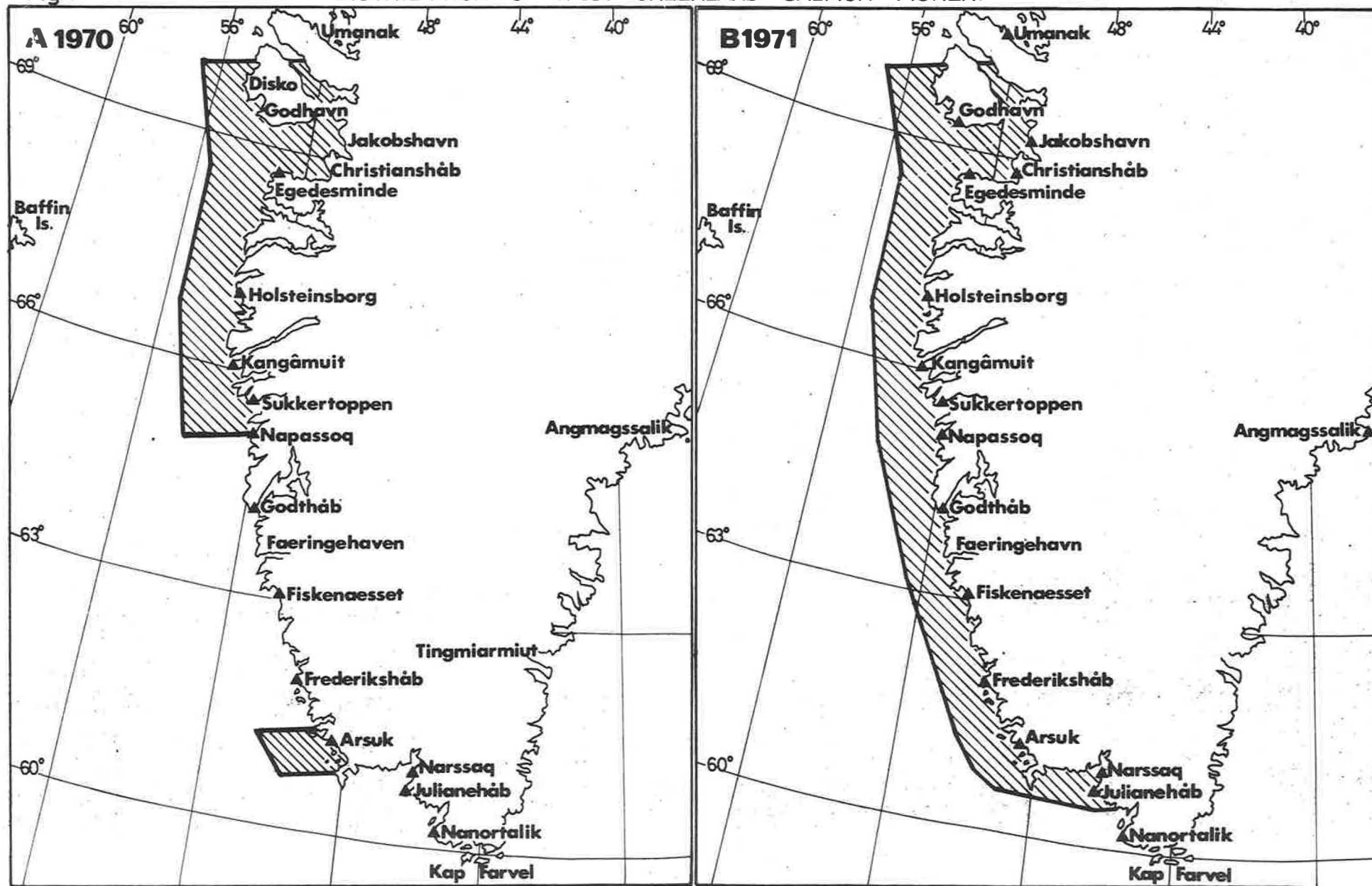
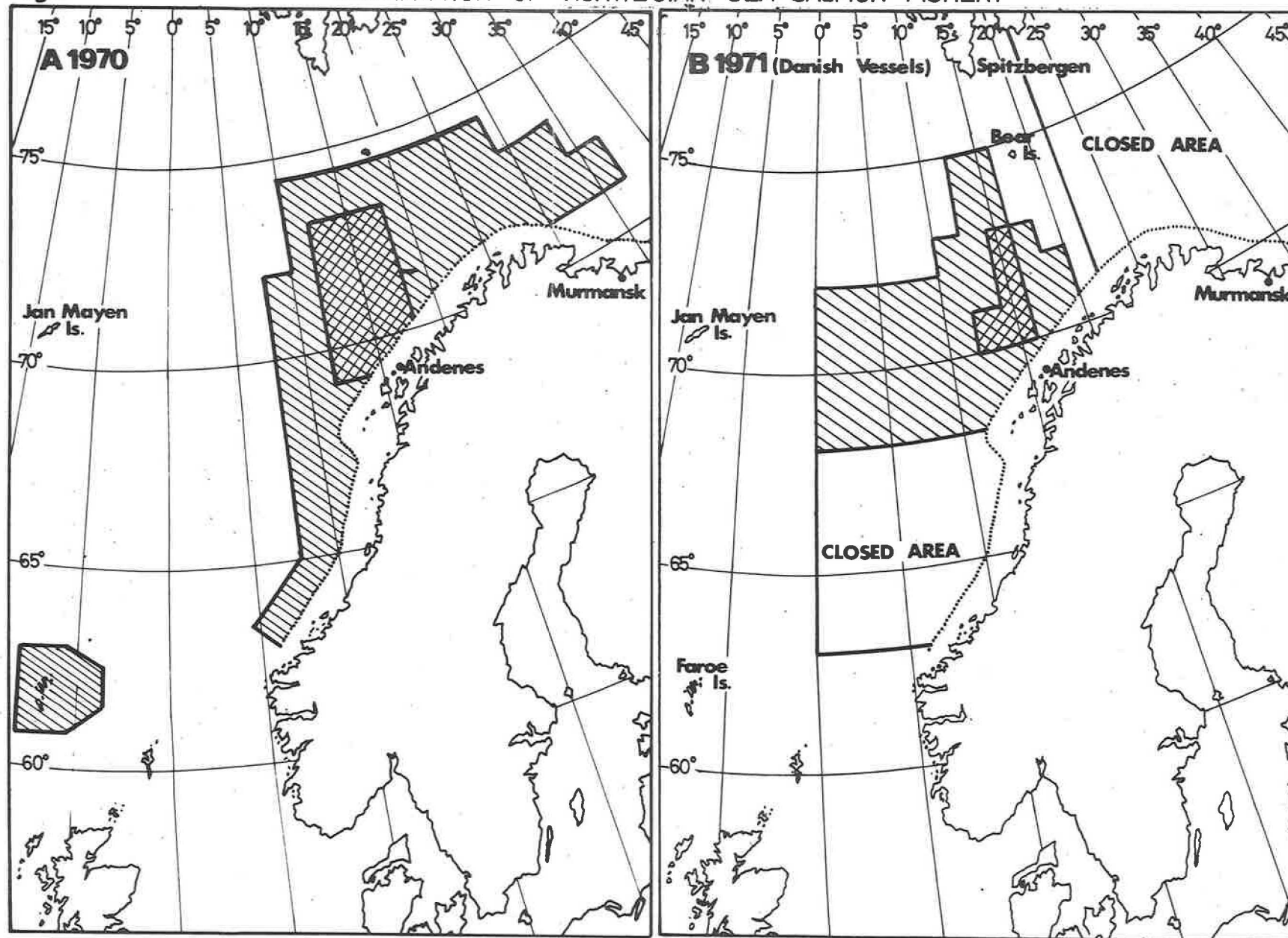


Fig.2

DISTRIBUTION OF NORWEGIAN SEA SALMON FISHERY



 Maximum extent of the fishery
  Area within which about 70% of the catch was taken

 Maximum extent of the fishery
  Area within which 43% of the fishery took place

